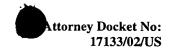
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Claims

What is Claimed is:

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-). An isolated nucleic acid sequence encoding a prenyltransferase.
- 2. An isolated nucleic acid sequence according to Claim 1, wherein said prenyltransferase is selected from the group consisting of straight chain prenyltransferase and aromatic prenyltransferase.
- 3. An isolated DNA sequence according to Claim 1, wherein said nucleic acid sequence is isolated from a eukaryotic cell source.
- 4. An isolated DNA sequence according to Claim 3, wherein said eukaryotic cell source is selected from the group consisting of mammalian, nematode, fungal, and plant cells.
- 5. The DNA encoding sequence of Claim 4 wherein said prenyltransferase protein is from Arabidopsis.
- 6. The DNA encoding sequence of Claim 5 wherein said prenyltransferase protein is encoded by a sequence selected from the group consisting of the sequences of Figure 1.
 - 7. The DNA encoding sequence of Claim 4 wherein said prenyltransferase protein is from corn.
- 8. The DNA encoding sequence of Claim 7 wherein said prenyltransferase protein is encoded by a sequence which includes the EST of the sequences of Figure 3.
- 9. The DNA encoding sequence of Claim 4 wherein said prenyltransferase protein is from soybean.
- 10. The DNA encoding sequence of Claim 9 wherein said prenyltransferase protein is encoded by a sequence which includes the ESTs of the group consisting of the sequences of Figure 2 and Figure 9.
- 11) An isolated DNA sequence according to Claim 1, wherein said nucleic acid sequence is isolated from a prokaryotic cell source.
- 12. An isolated DNA sequence according to Claim 11, wherein said prokaryotic source is Synechocystis.
- 13. A nucleic acid construct comprising as operably linked components, a transcriptional initiation region functional in a host cell, a nucleic acid sequence encoding prenyltransferase, and a transcriptional termination region.

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- 14. A nucleic acid construct according to Claim 13, wherein said nucleic acid sequence encoding prenyltransferase is obtained from an organism selected from the group consisting of a eukaryotic organism and a prokaryotic organism.
- 15. A nucleic acid construct according to Claim 14, wherein said nucleic acid sequence encoding prenyltransferase is obtained from a plant source.
- 16. A nucleic acid construct according to Claim 15, wherein said nucleic acid sequence encoding prenyltransferase is obtained from a source selected from the group consisting of *Arabidopsis*, soybean and corn.
- 17. A nucleic acid construct according to Claim 13, wherein said nucleic acid sequence encoding prenyltransferase is obtained from *Synechocystis*.
 - 18. A plant cell comprising the construct of Claim 13.
- 19. A method for the alteration of the tocopherol content in a host cell, comprising; transforming said host cell with a construct comprising as operably linked components, a transcriptional initiation region functional in a host cell, a nucleic acid sequence encoding prenyltransferase, and a transcriptional termination region.
- 5 20. The method according to Claim 10, wherein said host cell is selected from the group consisting of a prokaryotic cell and a eukaryotic cell.
 - 10 21. The method according to Claim 20, wherein said prokaryotic cell is Synechocystis.
 - 1 22. The method according to Claim 20, wherein said eukaryotic cell is a plant cell.
- The method according to Claim 22, wherein said plant cell is obtained from a plant selected from the group consisting of *Arabidopsis*, soybean, and corn.
- 24. A method for producing a tocopherol compound of interest in a host cell, said method comprising obtaining a transformed host cell, said host cell having and expressing in its genome:
- a construct having a DNA sequence encoding a prenyltransferase operably linked to a transcriptional initiation region functional in a host cell,

wherein said prenyltransferase is involved in the synthesis of tocopherols.

- The method according to Claim 24, wherein said host cell is selected from the group consisting of a prokaryotic cell and a eukaryotic cell.
 - 1 26. The method according to Claim 25, wherein said prokaryotic cell is Synechocystis.
 - The method according to Claim 24, wherein said eukaryotic cell is a plant cell.



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The method according to Claim 21, wherein said plant cell is obtained from a plant selected from the group consisting of *Arabidopsis*, soybean, and corn.

- 29. A method for increasing the biosynthetic flux in cell from a host cell toward tocopherol production, said method comprising transforming said host cell with a construct comprising as operably linked components, a transcriptional initiation region functional in a host cell, a DNA encoding a prenyltransferase involved in the synthesis of tocopherols, and a transcriptional termination region.
- 30. The method according to Claim 29, wherein said host cell is selected from the group consisting of a prokaryotic cell and a eukaryotic cell.
 - 31. The method according to Claim 30, wherein said prokaryotic cell is Synechocystis.
 - 32. The method according to Claim 30, wherein said eukaryotic cell is a plant cell.
- 33. The method according to Claim 32, wherein said plant cell is obtained from a plant selected from the group consisting of Arabidopsis, soybean, and corn.

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